B.C. HYDRO

PROJECT 8607

DEMAND SIDE MANAGEMENT

A PROGRESS REPORT

A report prepared in response to the B.C. Utilities Commission decision of 9 May 1986 to B.C. Hydro's Rate Hearing Application that "...directs the applicant to file a progress report on that program (purchased conservation) no later than 31 March 1987".

March 1987

EC
C68
1 D4
1987
c 2

Canadian Cataloguing in Publication Data

Main entry under title:
Demand side management

At head of title: Project 8607.

ISBN 0-7726-0645-5

1. Energy conservation - British Columbia. 2. Energy consumption - British Columbia. 3. B.C. Hydro. I. B.C. Hydro. Residential & Commercial Energy Management. II. Title: Project 8607.

TJ163.4.C3D24 1987 333.79'17'09711 C87-092088-X

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1. INTRODUCTION

The B.C. Utilities Commission (BCUC) Decision of 9 May 1986 to B.C. Hydro's application for an amendment to its Electric Tariff Rate Schedules, heard before the Commission in public hearings commencing 4 November 1985, ordered B.C. Hydro to respond to a number of directives. This report has been prepared in response to the Commission's specific directive in regard to Purchased Conservation as follows:

> PURCHASED CONSERVATION
>
> "The Commission recommends that the applicant commence its proposed purchased conservation program forthwith or as soon as practicable, and directs the applicant to file a progress report on that program no later than 31 March 1987."

Appendix A reproduces the Commission's purchased conservation recommendation.

2. DEMAND SIDE MANAGEMENT

Demand side management refers to the broader utility activities designed to influence customer use of energy in a way that will produce desired changes in the utilities load. Demand side management encompasses both load building and load reduction. Strategic energy conservation, which may be purchased or induced by other means such as education, is intended to reduce utility load. The reduction results from increased efficiency of energy use on the part of the customer that has been induced by the utility.

For B.C. Hydro, the benefit of load reduction programs result primarily from their impact on the timing of new generation projects. Any deferral of the required "in service" date for a project results in reductions of both cash flow and revenue requirements.

3. PLANNED DEMAND SIDE MANAGEMENT ACTIVITIES

The initial demand side management programs are concentrated in the area of strategic conservation for the residential sector, commercial lighting and energy efficient motors. Residential conservation is well understood and the load forecasting residential model provided a good base from which to size the potential for various programs. Three programs are being developed to address this area. Also, the lamp and motor areas had been investigated in the early 1980's, and this work formed the basis of the current programs. However, overall energy use in the commercial and industrial sectors is less well defined, and will be addressed over the next fiscal year.

The following programs are under development, and are scheduled to start pilot or full operation in fiscal 1987/88. These programs are described in more detail in Appendix B.

3.1 Energy Efficient Motors

This program will encourage the use of energy efficient motors and variable speed drives in the industrial and commercial sectors of B.C. Use of this technology will provide customers the same function, but will reduce energy requirements.

Market research is underway to more accurately determine the size of this market, and to determine customer decision making criteria so that a pilot project can be initiated in 1987/88. This pilot will improve Hydro's understanding of the acceptability of the technology, the levels of incentive required, and the actual load reduction from the motors and drives as they are in use. The pilot will take place in the second half of 1987/88, with monitoring continuing into the following year. The full program is scheduled for 1989/90. The pilot program is expected to deliver a load reduction of 0.2 GW.h in 1987/88 and 0.9 GW.h in subsequent years.

3.2 Energy Saver Lamps

This program will encourage the use of 35 watt four foot fluorescent lamps in place of the industry standard 40 watt units, and is focused primarily at the commercial sector. These lamps provide almost the same lighting levels with reduced energy requirement, and provide a good payback to users.

Market research will be initiated this fiscal year to determine the distribution channels for these lamps, and the customer criteria for purchasing standard or energy saver lamps. The program will be introduced on a pilot basis in 1987/88 to confirm the acceptability of the proposed approach, and to monitor actual load reduction. The full program will be introduced the following year. The pilot program is expected to deliver a load reduction of .2 GW.h in 1987/88 and .5 GW.h in subsequent years.

3.3 Residential DSM Programs

The residential sector will be addressed with three interlocking programs.

- The "Gas-Fuel of Choice" program is focused at new residential (including row house and apartment) construction and will reduce the number of dwellings that

use electricity for space and water heating. This will be accomplished by promoting the benefits of gas and addressing some of the technical barriers to gas usage in row houses and apartments.

This program will be initiated in 1987/88 and will be delivered via the Gas Group in conjunction with other gas marketing programs.

- The next step in addressing the residential market is to develop a residential construction standard which will reduce residential energy consumption for these homes. The standard must be acceptable to customers and the construction trade in order for it to be used on a widespread basis.

  This standard will be developed during 1987/88 and will be promoted to the trade for acceptance over a two-year period. In fiscal 1989/90, a significant promotional campaign will be launched to increase public demand for more efficient housing. As this program has the highest unit cost (in terms of cents per kW.h), Hydro will proceed cautiously to ensure that the program effectively delivers the required load impact.

- The final phase of the residential program addresses upgrading the weatherization of existing electrically heated houses. It is scheduled to start in fiscal 1990/91 to capitalize on the awareness created by the energy efficient home program.

The market penetration estimates for the residential programs are in addition to the level of conservation already included in the load forecast. This has been done to avoid "double counting" the strategic conservation estimates in the programs and the load forecast. Projected impacts of the demand side management programs are presented as reductions in forecast load.

The pilot projects have been designed to provide early experience with demand side management so that full scale programs are available to achieve the necessary load reduction when required. In addition, a strategic conservation program is being conducted in the diesel areas which will provide early experience in acceptability of conservation options as well as direct cost reductions to B.C. Hydro.

Further evaluation of demand side management potential is proceeding. Projects have been initiated to determine the impact of higher efficiency residential appliances and commercial energy use, as well as to develop tools to better assess the impacts of demand side management alternatives. The results of these investigations will be included in future Electric System Plans.

4. IMPACT OF DEMAND SIDE MANAGEMENT ON THE SYSTEMS PLAN

The impact of the revised demand side management scenario is summarized in the following table:

DSM Load Reduction, Costs & Impacts *
(expected values)

Year	GW.h	Cost ($'000)	Change in Revenue Requirements ($'000)
1987/88	0	670	700
1988/89	0	1,040	1,110
1989/90	24	1,640	1,200
1990/91	108	1,850	(370)
1991/92	179	2,340	(1,680)
1992/93	297	2,180	(4,750)
1993/94	408	2,190	(7,750)
1994/95	498	440	(12,300)
1995/96	576	450	(15,500)
1996/97	652	460	(26,600)
1997/98	732	400	(37,000)
1998/99	812	340	(32,000)
1999/00	912	320	(27,300)
2000/01	1003	290	(32,700)
2001/02	1084	50	(41,200)
2002/03	1146	50	(117,800)
2003/04	1233	50	(229,400)
2004/05	1306	50	(146,200)
2005/06	1365	50	(128,400)
2006/07	1420	50	(184,400)

This load reduction has been included in the current Electric System Plan, and has the following impacts:

- "In-service" dates for most system generation projects are delayed by one year on average.

- Cash flow and revenue requirements are reduced by almost $400** million and $500** million respectively. While the analysis was done over thirty years, almost all benefits were concentrated within the first twenty years. These reductions are modest in the first five years, but increase rapidly in subsequent periods.

- Revenue requirements per kW.h of domestic load are also lower as a result of these demand side management programs, in particular during the second ten years of the analysis when the load reduction has reached a significant level. This would mean that B.C. customers may pay lower rates than they would without demand side management programs.

* Excluding pilot projects.
** Expressed as present worth at a 5% discount rate.

Appendix C further details the impact of this demand side management scenario.

Future demand side management programs will be provided to System Planning for evaluation as part of the annual system plan. These should further reduce costs to customers and improve B.C. Hydro's future financial position.

5. MONITORING OF DEMAND SIDE MANAGEMENT PROGRAMS

A monitoring mechanism will be developed along with each program to determine the level of load reduction achieved on an ongoing basis. This will be done to ensure that the programs function as planned and to allow programs to be adjusted as required. Programs can be accelerated by adding resources and increasing their level of intensity.

The results of the monitoring will also be used to re-evaluate the demand side management program impact on the system plan. A revised projection of demand side management potential will be developed on an annual basis and will feed into the annual load forecast and system planning cycle.

APPENDIX A

ABSTRACT OF BCUC DECISION

9 MAY 1986

APPENDIX A

AN ABSTRACT FROM THE B.C. UTILITIES CORPORATION
DECISION OF 9 MAY 1986

IN THE MATTER OF
the Utilities Commission Act
S.B.C. 1980, c. 60, as amended

and

IN THE MATTER OF
Applications by
British Columbia Hydro and Power Authority

Load Management (Page 31)

3. Load Management - Marketing and Conservation

In the present period of surplus, the Applicant has implemented an aggressive export marketing program. Pursuant to the Industrial Electricity Rate Discount Act the utility has implemented an energy discount program to large industrial customers in the domestic market.

While these efforts and accomplishments to date have been appropriate during surplus conditions the Commission, as were some intervenors, is concerned that the Applicant does not appear to be giving sufficient priority to measures that will be necessary when the surplus will have been fully absorbed. Specifically, Mr. R.J. Gathercole argued that there are advantages to be gained by advancing the development of resources other than firm hydro (transcript page 1,938).

The Commission notes that because of concerns for its surplus position, the Applicant's planned purchased conservtion program as presented in Exhibit 31 has been deferred for two years (Ref. Appendix B). In contrast to this, in cross-examination Mr. Sheehan acknowledged that an effective conservation program takes a long time to develop momentum (transcript page 1,073). He further acknowledged that the projected cost of purchased conservation is 23.8 mills/kWh (transcript page 1,070) or approximately half the cost of new hydro-electric generation (transcript page 207). In his final argument Mr. Gathercole accordingly urged the Applicant to give first priority in resource planning to conservation resources.

On the basis of the foregoing and the evidence in Appendix B, the Commission recommends that the Applicant commence its proposed purchased conservation program forthwith or as soon as practicable, and directs the Applicant to file a progress report on that program no later than March 31, 1987. As addressed in Section G of this Decision the Applicant will be expected to demonstrate the validity of relying on conservation as a resource.

APPENDIX B

DEMAND SIDE MANAGEMENT -

PROGRAM SUMMARIES

EE MOTOR PROGRAM

PROGRAM OBJECTIVE: To reduce electric base load and future load growth by encouraging the use of energy efficient electric motors and variable speed drives.

PROGRAM DESCRIPTION: Electric motors use approximately 65% of the electricity consumption for commercial and industrial customers. This program is designed to promote the use of high efficiency motors and associated equipment in all new installations and for replacement of nonfunctioning equipment. The program does not anticipate that functioning motors will be replaced.

PROGRAM STRATEGY: The program will use direct market research and secondary data to size the target market, and customer decision making criteria.

A pilot project will be used to test market response and develop some reference accounts.

The program will use promotion and education to raise customer awareness of potential benefits, supported by trade advertising, and direct mail.

Direct customer contact, supported by computer analytical models, will be used to quantify specific customer benefits.

TARGET MARKET: This program will be available throughout Hydro's electric service area, and will target approximately 14,000 customers who account for over 80% of the industrial and commercial electricity consumed.

PROJECTED IMPACT:

Twenty year load reduction: 7,309 GW.h Total Cost: $3,752,000
Peak year reduction: 748 GW.h Unit Cost: .75¢/kW.h

CURRENT ACTIVITIES: The target market is currently being sized via questionnaire and a pilot program is being developed for fiscal 1987/88. The full program is not expected to start until fiscal 1989/90.

BUDGET:

	1987/88	1988/89
Manpower	30 mm	-
Direct Costs	$77,000	-

LOAD TRACKING: Installations from the pilot program will be closely monitored to determine actual load reduction.

The rebate will provide a basis for monitoring the impact of the EE motors on load reduction.

ENERGY SAVER LAMP PROGRAM

PROGRAM OBJECTIVE: To reduce electric base load and load growth by encouraging use of 35 watt energy saver four foot fluorescent lamps in place of the standard 40 watt lamp.

PROGRAM DESCRIPTION: Although the E.S. lamps have a short payback (less than 1 year if replaced on burnout), the adoption of this technology has been slow. This is attributed to their higher initial cost. The program intends to increase this penetration by providing a rebate to reduce the initial cost premium in conjunction with an advertising/promotion campaign to increase awareness of potential savings.

PROGRAM STRATEGY: Use market research to identify specific target markets with differing decision making criteria and develop specific approaches to address each criteria.

Use trade advertising and direct mail to raise customer awareness of potential benefits.

Use seminars and trade training to raise understanding of technical considerations and benefits.

Use rebate to overcome resistance to higher initial cost of ES lamps if market research confirms rebate necessity.

Use pilot project to develop 'Reference Accounts' and confirm consumer response to program.

TARGET MARKET: This program will be targeted at the commercial sector, and will be available throughout Hydro's electric service area.

PROJECTED IMPACT:

Twenty year load reduction: 2,812 GW.h Total Cost: $4,364,000
Peak year reduction: 202 GW.h Unit Cost: .28¢/kW.h

CURRENT ACTIVITIES: A pilot project is under development for introduction in fiscal 1987/88. This pilot is expected to deliver a load reduction of 2 GW.h in fiscal 1987/88 and 5 GW.h in subsequent years.

BUDGET:

	1987/88	1988/89
Manpower	12 mm	60 mm
Direct Costs	$70,000	$229,000

LOAD TRACKING: The number of rebates will be tracked to determine the level of load reduction. The 'no program' trend for E.S. lamp sales is known and will be included to determine the actual program impact.

GAS-FUEL OF CHOICE PROGRAM

PROGRAM OBJECTIVE: To reduce future electric load growth through shifting electric space heating and domestic hot water heating applications to natural gas.

PROGRAM DESCRIPTION: Loads for new residential customer heating applications will be encouraged to use gas or, if remaining electric, will be optimized through the promotion of more efficient technologies.

Since natural gas has a substantial cost advantage over electricity, the program is designed to promote its low operating and life cycle costs. Also, promotion of the use of more efficient heating equipment will be aimed at electric accounts to further reduce the future load growth.

This program considers the declining energy consumption per account that is included in the load forecast.

PROGRAM STRATEGY: Promote the cost advantages of natural gas over electricity for space and domestic hot water heating.

Address the technical barriers to more widespread use of gas in rowhouses and apartments, including use of the 2-psig piping system.

Provide presentations and training for builders, developers and real estate agents to convey the benefits of gas heating.

Provide advertising and promotion to convey the benefits of natural gas.

Use customer advisory staff and computer models to provide individualized cost/benefit analysis for customers.

TARGET MARKET: The program will focus on:

- single family/duplex
- row houses
- apartments
- mobile/seasonal/miscellaneous

It will be concentrated in the Lower Mainland initially due to the concentration and large potential. It will then be expanded to the rest of the province.

PROJECTED IMPACT (Lower Mainland only):

Twenty year load reduction:	820 GW.h	Total Cost:	$831,000
Peak year reduction:	116 GW.h	Unit Cost:	.34¢/kW.h

CURRENT ACTIVITIES: Program under development in conjunction with the Gas Marketing Group for early fiscal 1987/88 introduction. The program will be integrated with other marketing programs.

BUDGET:

	1987/88	1988/89
Manpower	25 mm	16 mm
Direct Costs	$46,000	$32,000

LOAD TRACKING: The ratio of gas/electric heating will be monitored, and compared against the historical trend to insure that the program is providing the desired shift.

HYDRO HOME PROGRAM

PROGRAM OBJECTIVE: To reduce future electric load growth by developing and promoting higher building standards for new homes that will use electricity for space and domestic hot water heating. The new standard must be sufficiently acceptable to the community that 'Spec' housing will be built to this standard.

PROGRAM DESCRIPTION: The program will develop energy efficient new house construction recommendations which recognizes the climatic and fuel cost differences in B.C.

Hydro is considering establishing this program in conjunction with the Canadian Home Builders' Association, (CHBA) who currently administer the R2000 program for EMR.

This program applies to electrically-heated new construction that has not been shifted by the "fuel of choice" program.

PROGRAM STRATEGY: Develop a building standard to meet B.C. climate conditions.

Provide trade and real estate training to increase knowledge of buildings standards, life-cycle costs and benefits.

Use customer advisory function and computer advisory models to provide low cost customer specific quantification of benefits.

Use advertising/displays to raise consumer awareness of benefits of improved building standards

TARGET MARKET: This program will be targeted at Vancouver Island and Lower Mainland housing, as these areas have lagged behind other areas in the Province in adoption for more energy efficient building envelopes.

PROJECTED IMPACT:

Twenty year load reduction:	250 GW.h	Total Cost:	$2,829,000
Peak year reduction:	27 GW.h	Unit Cost:	3.5¢/kW.h

CURRENT ACTIVITIES: Negotiate with CHBA to determine possibility of a joint program, and evaluate benefits of such a program.

Develop B.C. building standard and promote to Hydro and trade for acceptability.

BUDGET:

	1987/88	1988/89
Manpower	28 mm	41 mm
Direct Costs	$26,000	$30,000

LOAD TRACKING: Track number of homes built to this standard, and monitor load reduction.

HYDRO RETROFIT PROGRAM

PROGRAM OBJECTIVE: To reduce base load electric consumption by increasing the insulation in existing electrically heated homes.

PROGRAM DESCRIPTION: This program will provide a loan to home owners to improve the level of insulation and weatherization in existing housing. The program will include items such as increased attic and wall insulation, double/triple glazed windows, and better caulking and sealing. The program will be linked with the Hydro Home Program to benefit from the increased awareness resulting from it's advertising and promotion.

PROGRAM STRATEGY: Use of advertising to raise awareness of potential customer benefit and availability of Hydro assistance.

Provision of a loan or incentive.

Use of customer advisory staff and computer models to assist customers in quantifying benefits.

TARGET MARKET: All electrically heated houses in the B.C. Hydro service area. This program is scheduled to start in 1991/92 to build on the momentum created by the Hydro Home Program.

PROJECTED IMPACT:

Twenty year load reduction:	1,129 GW.h	Total Cost:	$3,333,000
Peak year reduction:	114 GW.h	Unit Cost:	.75¢/kW.h

CURRENT ACTIVITIES: Will build upon Hydro Home Standards.

BUDGET: None required until 1990/91.

LOAD TRACKING: Track number of loans and level of insulation to estimate load reduction. Spot check individual residences to confirm load reduction.

DIESEL AREA CONSERVATION PROJECT

PROGRAM OBJECTIVE: To extend the current EMR/Hydro program and reduce electric load in the diesel area. This will include identifying potential saturation, practicality and economic viability of different technologies. To work with customers on a personal basis to improve our understanding of customer priorities and decision making process.

PROGRAM DESCRIPTION: The program will use on-site audits to survey buildings and identify potential strategic conservation opportunities. Practical, acceptable options will be developed, along with necessary financial incentives. These will be presented to customers in the diesel areas and the results monitored and evaluated both for customer acceptability and resultant benefits.

TARGET MARKET: Commercial and industrial customers in the non-integrated electric areas that are served by B.C. Hydro.

PROJECTED IMPACT: Due to the experimental nature of this project, it is not possible to predict the impact. However, all incentives provided must provide a three year payback to Hydro, as well as providing customer benefits.

CURRENT ACTIVITES: Implementation of the initial EMR project is underway, and some account audits have been initiated.

BUDGET:

	1987/88	1988/89
Manpower	12 mm	6 mm
Direct Costs	$80,000	$35,000

LOAD TRACKING: The commercial data base computer system will be used to track all customers who are part of this project.

APPENDIX C

IMPACT OF DEMAND SIDE MANAGEMENT PROGRAMS ON THE 1987/88 ELECTRIC SYSTEM PLAN

REPORT - JANUARY 1987

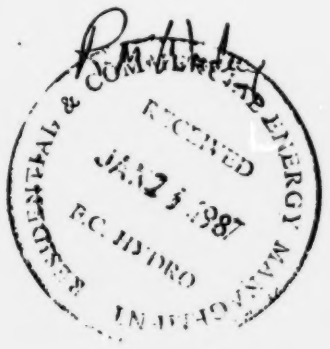
Inter-office memo ⊕ B.C.Hydro

TO: Dr. Z. El-Ramly 22 January 1987

FROM: R.M. Woodley File: 980.2

SUBJECT: Demand-Side Management Programs

As requested, attached is a revised report on the economic evaluation of DSM programs which was originally provided to you on 4 November 1986. This new version reflects the most recent data on program costs, forecast demands and the new electric System Plan. Overall, economic benefits from DSM programs remain essentially as reported in November, although this time the analysis has been carried out over thirty years (ie. 1987-2016) to capture some cash flow adjustments that take place in the period 2007-2016. Cash flow and revenue requirements are reduced by DSM (in present worth terms) by close to $400 million and $500 million respectively, with almost all benefits concentrated within the first twenty years. We understand this information will be submitted to the B.C. Utilities Commission, to meet the requirements of their 9 May 1986 Decision on Rates. Let us know if you require any further information.



Attachments

VdB/jb

cc: W.A. Best
J.H. Drinnan
D.R. Forrest
D.G. McFarlane
K.G. Peterson

20/5/328

919M

EVALUATION OF DEMAND-SIDE MANAGEMENT PROGRAMS IN B.C. HYDRO'S 1987/88 ELECTRIC SYSTEM PLAN

Introduction

Five demand-side management (DSM) programs developed by the Energy Management Department have been included in the 1987/88 Electric System Plan. Program costs and resulting load reductions (with associated probabilities of occurrence) have been estimated, reflecting in each case the latest market and load forecast information.

These programs are:

(i) Shift of residential electric heating to gas program (in the Lower Mainland).

(ii) Lamp rebate program (mainly commercial sector).

(iii) Energy-efficient motor program (industrial).

(iv) Energy efficient home program promoting higher building standards for electrically-heated new homes.

(v) Home retrofit program (for existing homes).

The analysis below addresses a number of questions related to the potential economic benefits to B.C. Hydro that would arise from inclusion of DSM as an alternative resource, as follows:

- relative economics of individual DSM programs.
- impact of DSM on the timing of new generation additions.
- economic benefits from DSM, measured through selected performance indicators.
- optimal timing of DSM programs.

It is important to recognize that given the energy-critical nature of the B.C. Hydro system, which is expected to prevail for most of the first twenty years of this analysis, any benefits from DSM to B.C. Hydro will arise almost entirely from energy savings generated by those DSM programs provided that their cost is lower than that of new generation (and from displacement of more expensive thermal energy, purchases from other utilities, cogeneration, etc.).

Benefits from DSM load shaping are unlikely to be of any significance to the Integrated System as a whole over the next twenty years, given the system's high reservoir regulating capability, and therefore, have not been examined.*

*There may be some potential load shaping benefits arising from modified operation for the month of May, but the outcome may also be influenced by B.C. Hydro's position in the export market.

Main Assumptions

The following criteria and data have been utilized in this study:

1. Scheduling of new generation additions excludes consideration of interruptible export markets. (Studies to date indicate that the return on investments in capacity ahead of domestic need is not high enough.) However, interruptible export markets are included in the presentation of economic results of alternative sequences.

2. The Peace Site C Project has been scheduled in all cases to meet firm export contract demands.

3. DSM has been treated as a load reduction, rather than as an additional resource. Expected energy savings result from combining estimated savings under different probabilities of occurrence.

4. The economic evaluation has been carried out over thirty years (ie. 1987-2016), to account for some cash flow adjustments beyond twenty years, although DSM program data is available for only twenty years.

5. DSM program costs have been treated as operating costs at this stage, pending agreement on whether they should or should not be capitalized. The results obtained on the relative economics of DSM should not be affected significantly by this issue (although eg. annual cash flows will).

6. The analysis is based on the July 1986 B.C. Hydro electric load forecast.

Economics of individual DSM programs

An approximate evaluation of the unit cost of the DSM programs was carried out to verify whether potential energy savings could be achieved at a cost lower than that of the alternatives. DSM unit costs were calculated for a probability of availability in the 90% area. By comparison, the value of firm energy reported in Generation Planning studies on short-term and long-term value of power covers the 80-100% probability range.

Approximate Unit Cost of DSM
load reductions (90% probability)

Program	Unit Cost (¢/kWh, 1986)
Electric Heating to Gas Program	0.34
Lamp Rebate Program	0.28
EE Motor Program	0.19
Hydro Home Program	3.5
EE Home Retrofit Program	0.75

Above costs are twenty-year (1987-2006) levelized costs at a 5% discount rate. They include all costs borne by B.C. Hydro, i.e. including rebates.

The value of firm energy to B.C. Hydro, after accounting for line losses, is higher, as shown below.

Year	BCH Integrated System Value of firm energy* (¢/kWh, 1986)
1988/89	0.9
1990/91	1.4
1992/93	2.0 - 2.1
1994/95	2.4 - 2.6
1996/97	3.2 - 3.4
1998/99 and thereafter	4.0 - 4.3

*Range reflects whether energy is used in the industrial, commercial or residential sectors.

Impact of DSM programs on the timing of new generation

The inclusion of DSM programs generates annual load reductions (expressed as expected values) indicated below. This is sufficient to allow postponement of new generation by one year on average while maintaining the same planning criteria on maximum acceptable probability of supply deficiencies. The two sequences (with and without DSM) are also compared below.

DSM load reductions
(expected values)

Year	GW.h	Year	GW.h
1987/88	0	1997/98	732
1988/89	0	1998/99	812
1989/90	24	1999/00	912
1990/91	108	2000/01	1003
1991/92	179	2001/02	1084
1992/93	297	2002/03	1146
1993/94	408	2003/04	1233
1994/95	498	2004/05	1306
1995/96	576	2005/06	1365
1996/97	652	2006/07	1420

Project in-service dates

Project	No DSM	With DSM
Peace Site C (Firm Export)	1995	1995
Keenleyside	1996	1997
Murphy Creek	1999	1999
Iskut/More Creek	2002	2004
Stikine	2005	2006
Tanzilla	2007	2008
Hat Creek 2000 MW	2008-12	2009-12

Economic Benefits from DSM

The economic benefits arising from inclusion of DSM in B.C. Hydro's 1987/88 System Plan have been measured on the basis of:

i) Reduced cash flow requirements "to perpetuity" (at a 5% discount rate, net of inflation), (Attachment 1, right chart).

ii) Lower present worth of cumulative cash flow, over 30 years (Attachment 2).

iii) Reduced present worth of cumulative revenue requirements. (Attachment 3).

iv) Lower revenue requirements per kWh of domestic load (Attachment 4).

20/5/328A

Optimal timing of DSM programs

Additional analyses carried out to investigate the impact of possible advancement of two DSM programs to their earliest feasible in-service dates found that these changes would result in marginal improvements in both cash flow and revenue requirements, although at a cost over the near term (ie. over the period 1988-1990).

Conclusions

1. Inclusion of selected DSM programs in B.C. Hydro System Plans would offer considerable economic benefits. Revenue requirements are reduced almost every year, resulting in savings of close to $500 million over the thirty-year period 1987-2016 (present worth @ 5% discount rate). The bulk of the savings are concentrated within the period 1993-2006.

2. Revenue requirements per kWh of domestic load are also lower if DSM programs are adopted, in particular during the second ten years of the analysis (ie. when DSM savings have reached a significant level). This should ensure that B.C. customers would pay lower rates over time as a result of adopting DSM.

3. Inclusion of DSM provides improved annual cash flow over the thirty-year period 1987-2016, with the exception of the period 2002 - 2010, due to generation project rescheduling. DSM programs would generate savings of almost $400 million over thirty years (expressed in present worth at a 5% discount rate). These benefits are modest during the first five years ($20 million for 1987-1991), but increase rapidly by a further $150 million and $750 million over the following five-year periods. After a net reduction in the order of $500 million for the years 2002-2007, cash flow stabilizes at a level between $300 and $400 million above the alternative without DSM. In the long run (ie. to perpetuity), estimated net cash flow benefits amount to $650 million. Since DSM program data is available only up to twenty years into the future, this raises the question of the possible impact of extrapolating trends.

4. A commitment to the DSM programs proposed by the Energy Management Department would allow postponement of new generation projects by one year on average. This could in turn provide enhanced planning flexibility by allowing deferment of decisions on further investments in new capacity.

5. Although the additional economic benefits may be relatively limited, it appears advisable to launch DSM programs as soon as practicable. However, fine-tuning of their timing may require more definite information on market, cost and other program data.

6. From a system planning standpoint, additional DSM programs which may offer a reasonable chance of being economically competitive should be considered given their potential to further improve B.C. Hydro's future financial position.

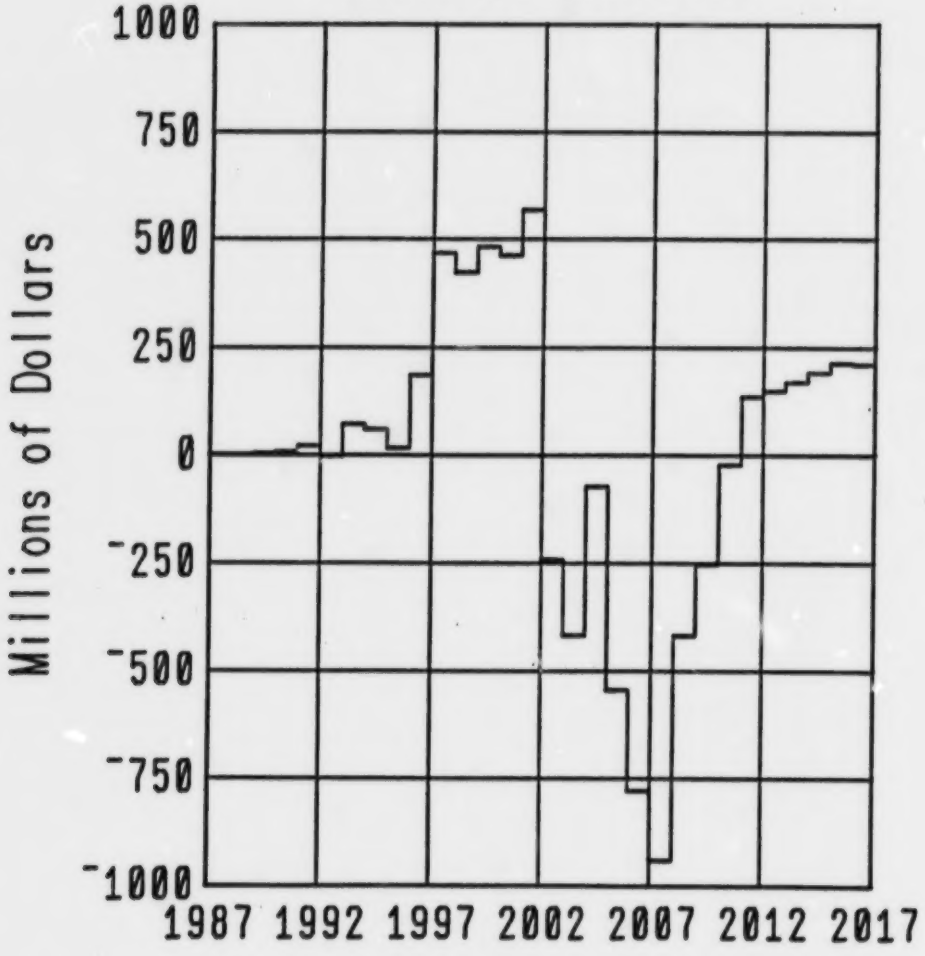
VdB/jb
21 January 1987

20/5/328A

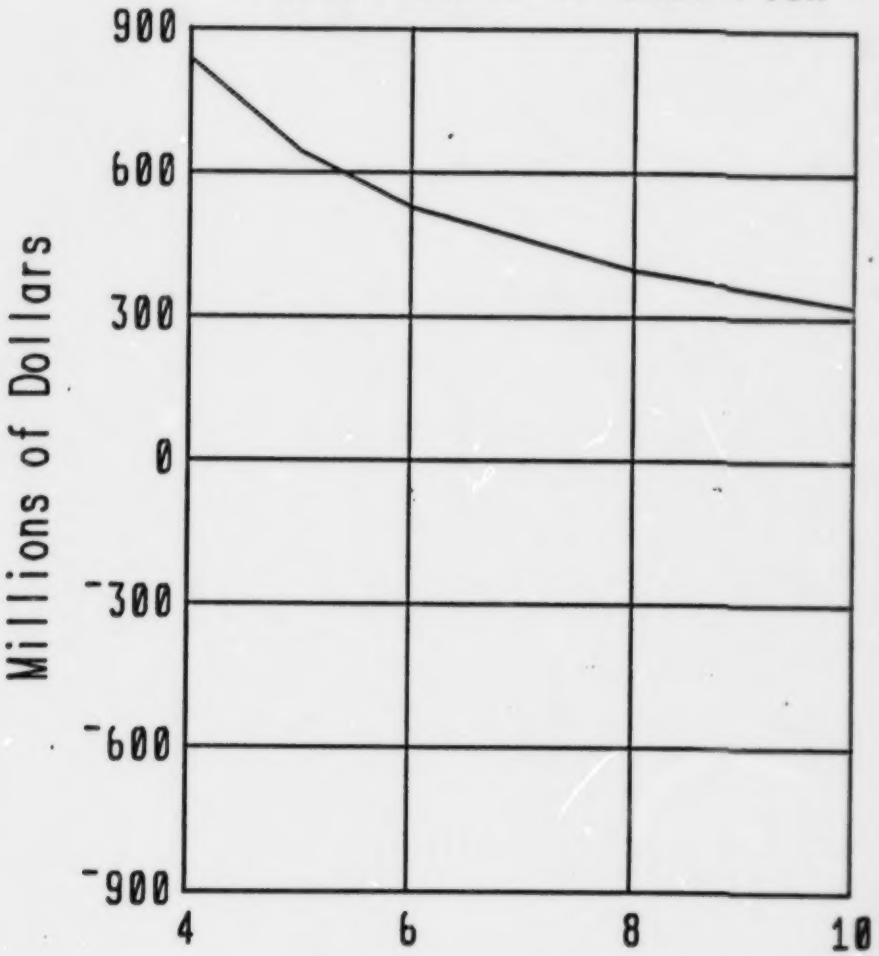
EXPORT PLAN WITHOUT DEMAND SIDE MANAGEMENT

(STC 95, KNL 96, MUR 99, ISK/STK 02/05/07, HCK2000 08/09/11/12)

Difference between Inflated Cash Flow



Difference between Present Worth of Cash Flow

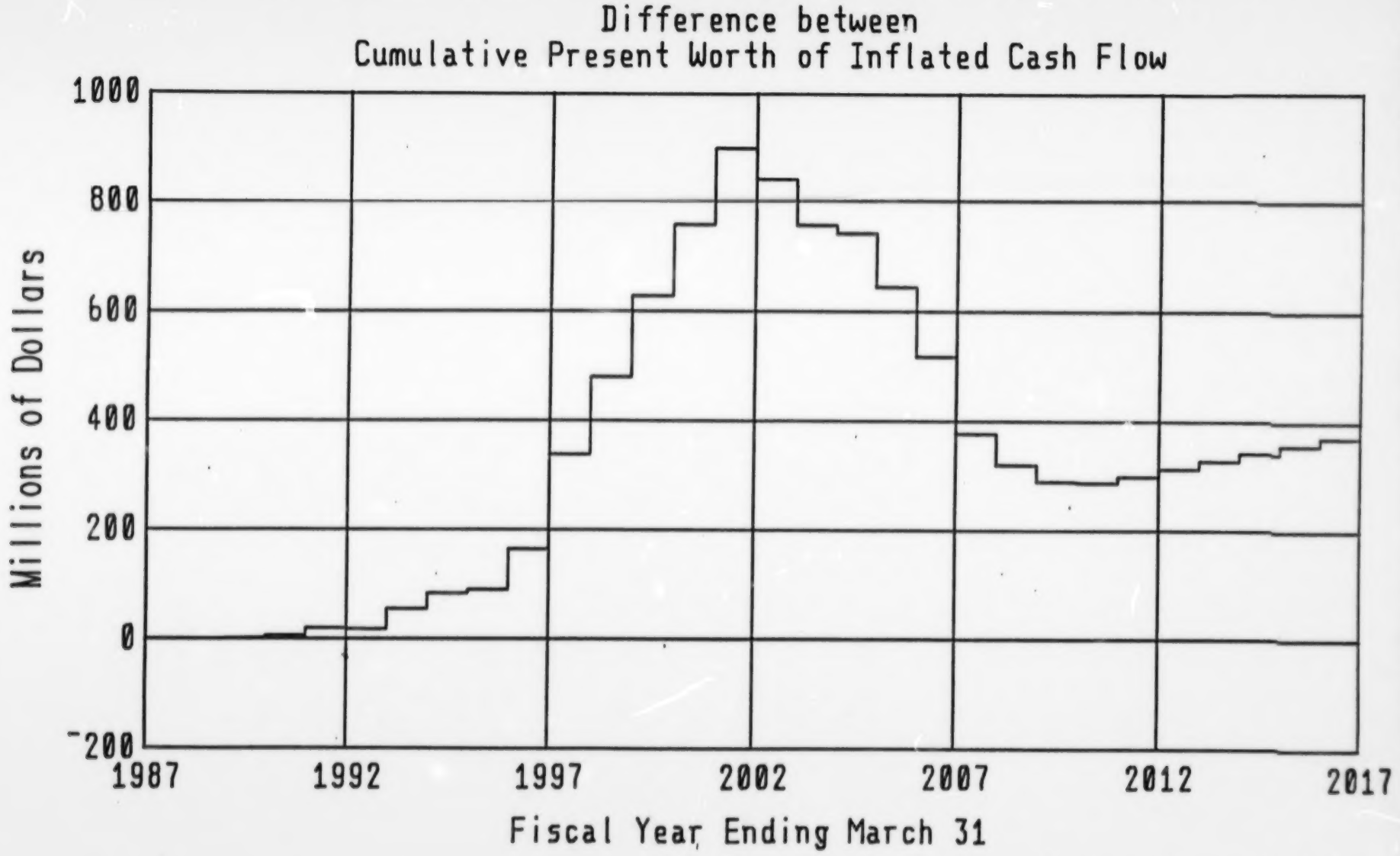


BASE: BASE CASE EXPORT PLAN WITH PEACE SITE C FIRM EXPORT

Generation Planning
20 Jan 1987

ATTACHMENT 2

EXPORT PLAN WITHOUT DEMAND SIDE MANAGEMENT
(STC 95, KNL 96, MUR 99, ISK/STK 02/05/07, HCK2000 08/09/11/12)



BASE: BASE CASE EXPORT PLAN WITH PEACE SITE C FIRM EXPORT

Generation Planning
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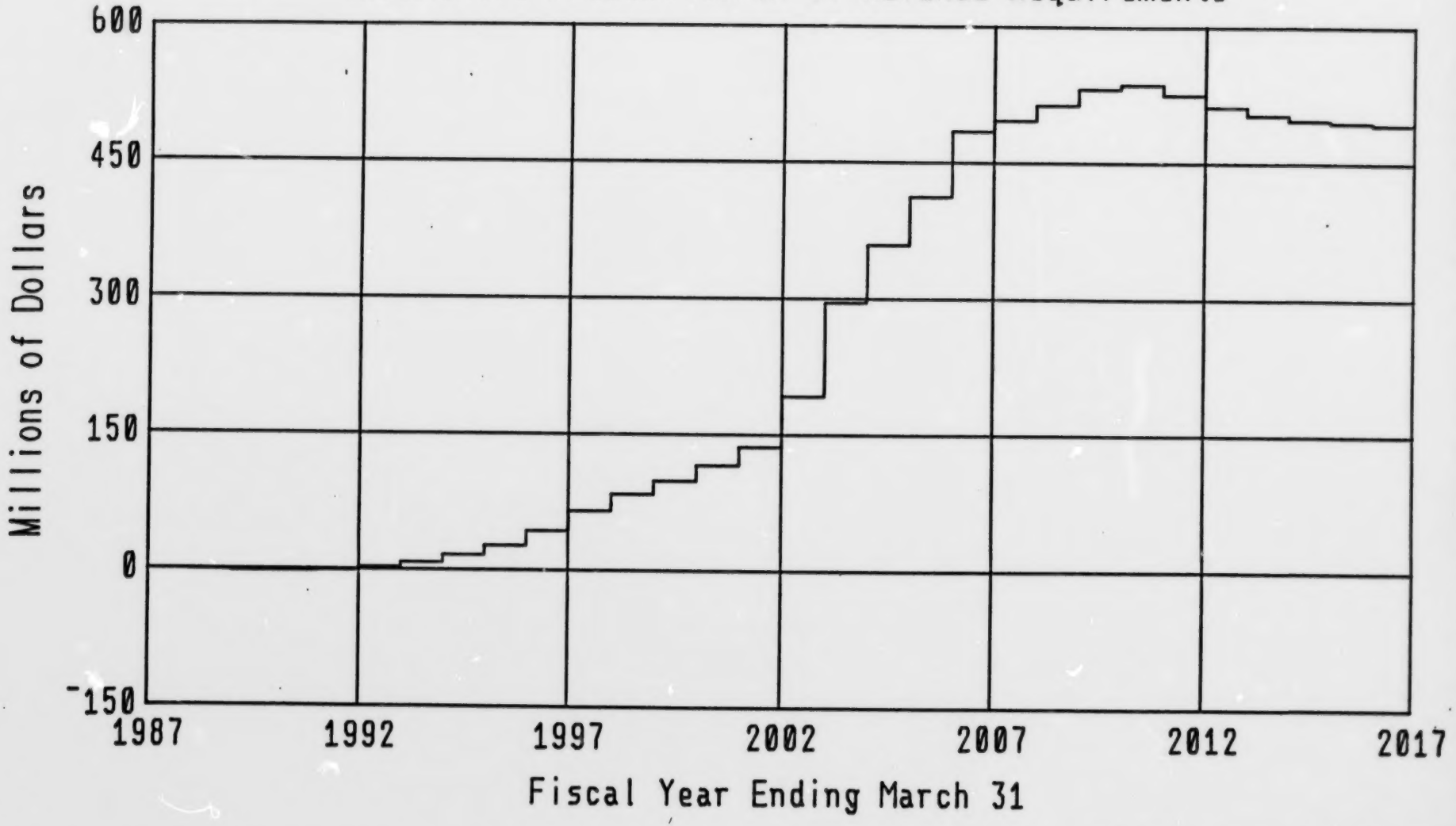
ATTACHMENT 3

EXPORT PLAN WITHOUT DEMAND SIDE MANAGEMENT
(STC 95, KNL 96, MUR 99, ISK/STK 02/05/07, HCK2000 08/09/11/12)

Difference between
Cumulative Present Worth of Revenue Requirements



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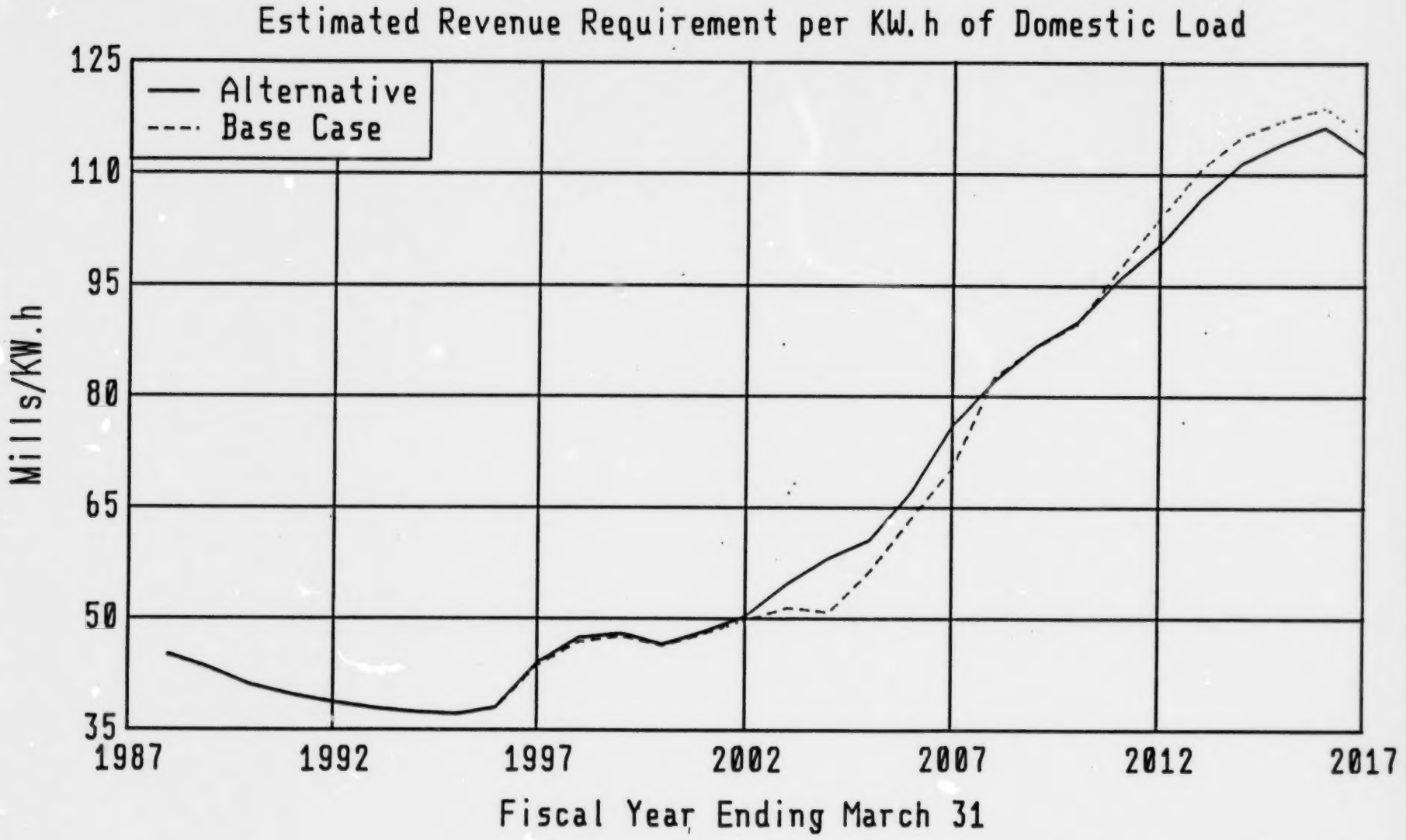
EXPORT PLAN WITHOUT DEMAND SIDE MANAGEMENT
(STC 95, KNL 96, MUR 99, ISK/STK 02/05/07, HCK2000 08/09/11/12)



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